

Self-consistent particle simulation of whistler-mode triggered emissions

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Self-consistent electromagnetic particle simulations have been performed to analyze whistler-mode triggered emissions in the magnetosphere. Triggering whistler-mode waves injected at the magnetic equator induce a nonlinear absolute instability that results in rising tone emissions similar to natural whistler-mode chorus emissions. The triggering wave causes a depletion of resonant electrons at the resonance velocity. The phase-organized resonant electrons released by the triggering waves generate coherent waves that undergo nonlinear growth with increasing frequencies. The essential mechanism is the same as that for the generation of chorus emissions. Saturation of the nonlinear wave growth is caused by enhancement of resonant electrons at high pitch angles that have been trapped and guided along the resonance velocity by the triggered emissions. Because of the decreasing resonance velocity resulting from the increasing frequency, trapped electrons are accelerated to higher pitch angles. Saturation of the nonlinear wave growth thereby results in electron acceleration.